Disaster Preparedness for Water Contamination Events:
Lessons Learned from Hurricane Katrina
Center for Public Health Preparedness Grand Rounds
Patricia L. Meinhardt, MD, MPH, MA
February 9, 2006

SCHOOL OF PUBLIC HEALTH
UNIVERSITY AT ALBANY State University of New York

University at Albany
Center for Public Health
Preparedness
Grand Rounds Series
Thursday, February 9, 2006

10–11 a.m. & 4-5 p.m. (EST)

Water Contamination Events: Lessons Learned from Hurricane Katrina

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Evaluation

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Contamination of Water Reserves is a Serious Public Health Threat Given That:

- **Safe drinking water is vital for human survival.**
- **Water is essential for basic hygiene and modern sanitation.**
- **Water use is key to every sector of our industrialized economy.**
- **Uncontaminated water is crucial to food production and livestock health.**

Contamination of a Community's Water Supply with Biological, Chemical or Radiologic Compounds May Result From:

- **Natural disasters such as hurricanes and earthquakes**
- **Manmade accidents such as chemical or radiologic releases in source water**
- **Intentional contamination or acts of water terrorism**

Even Short-term Disruption of Water Service May Lead to:

Serious medical, public health, AND economic consequences for a community.

1993 Waterborne Cryptosporidiosis Outbreak: Milwaukee, WI

- **403,000 Milwaukee residents developed diarrhea with 52% of the population affected**
- **Over 4,000 Milwaukee residents hospitalized during waterborne outbreak**
- **Cryptosporidiosis listed as underlying or contributory cause of death for 54**
- **Cost more than $54 million including 725,000 lost work days for affected residents**

2000 Waterborne *E. coli* O157:H7 Outbreak: Walkerton, Ontario

- 2,300 symptomatic residents or 40% of the population affected with 7 deaths
- $11 million required to reconstruct community water system
- Total cost of outbreak $155 million to date

(CP Photo Kevin Frayer)

Preliminary Damage Estimates to Water Systems by Katrina

- **1,236 public water systems damaged or destroyed in LA and MS**
- **200 sewage treatment plants affected in LA, MS, AL**
- **Loss of power to lift stations created sewage overflow into homes and streets**
- **Fecal and chemical contamination of water distribution pipes and source water**

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Preliminary Cost Estimates of Public Water Supply Damage by Katrina

In hardest hit, high impact counties of LA and MS, estimated cost of repairing just WATER SUPPLY infrastructure:

$2.25 Billion

Water systems damaged by *natural* or *intentional* disasters create numerous medical, public health, and disaster response challenges.

Challenge 1: Removal and Disposal

Removal and disposal of contaminated water and standing water from residential areas and industrial facilities.

AP Images

Challenge 2: Clean-up and Repair

Clean-up and repair of contaminated water plants, distribution pipes, water storage facilities, mechanical and electrical equipment, and related computer control systems for water utilities.

Challenge 3: Check and Repair

Flushing, sanitizing, and water quality checks for EVERY water distribution line in the affected community including residential areas and industrial facilities.

Repairing hundreds of underground water pipe breaks resulting from flood or earthquake damage.

Courtesy of the US EPA

Challenge 4: Clean-up of Waste Water

Clean-up and repair of wastewater systems to treat residential sewage, industrial waste, and agricultural run-off.

Draining, cleaning, vacuuming, and pumping each affected storm drain.

In New Orleans alone this involved draining, cleaning, and vacuuming 55,000 storm drains.

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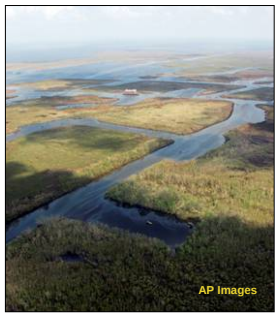
Challenge 5: Providing Alternative Water

Cost and distribution of alternative water supplies for ALL community water needs until the water systems are back on line.

Challenge 6: Cleaning Source Water

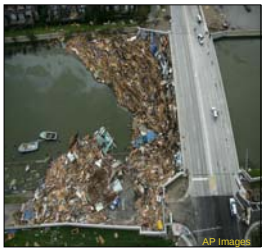
Clean-up of source water including rivers and lakes.

Clean-up and testing of contaminated ground water and potentially tens of thousands of private wells.



Cost estimate of $2.25 Billion for Katrina Damage to Water Supply Systems Does NOT Include the Cost of:

- **Water supply damage from Hurricane Rita**
- **Repair/replacement of damaged wastewater plants**
- **Clean-up of source water contamination**
- **Costs of alternative water sources**



Who Needs to Prepare

Preparing for water contamination resulting from natural disasters, man-made accidents, or water terrorism is *critical* for ALL local and state disaster response.

Key Disaster and Terrorism Preparedness Strategy for All States:

Careful disaster preparedness for water contamination events may make the difference between a *controlled response* versus a *public health crisis* in your community.

Critical Disaster Strategies

Water contamination poses several unique preparedness challenges that require specific *pre-incident planning* and *post-event response strategies*.

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Disaster Strategy 1:

Understand that preparedness for water contamination events is critical in order to reduce:

- **Public health impact of water contamination**
- **Secondary disruption to potable water and wastewater treatment**
- **Psychological impact of *public's lack of confidence* in water safety and quality**

Disaster Strategy 2:

Ensure that alternative sources of drinking water are part of every disaster preparedness plan to guarantee affected communities have adequate potable water for *days to weeks* after a water contamination event.

CP Photo Kevin Frayer

Disaster Strategy 3:

Prioritize the *special needs of susceptible populations* most at risk for morbidity and mortality from dehydration, waterborne disease, and the health effects of water contamination.

(CP Photo Kevin Frayer)

Disaster Strategy 4:

Understand the *important role of LOCAL medical and public health practitioners* who will be the "front-line responders" in detecting and managing water-related disease from natural or intentional water contamination.

Disaster Strategy 5:

Recognize the *multiple pathways* for human exposure to contaminated water during a disaster event including:

- **Ingestion and aspiration of water**
- **Dermal absorption during recovery efforts or bathing with contaminated water**
- **Consumption of food directly contaminated with water during food preparation**
- **Consumption of food indirectly contaminated by water via food chain or agricultural practices**

Disaster Strategy 6:

Recognize that many of the water-related diseases and syndromes associated with disaster events may be *unusual presentations of disease* not commonly seen in the community.

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Unusual Diseases Seen After Katrina

- Vibrio vulnificus
- Vibrio parahaemolyticus
- Leptospirosis
- Waterborne E. coli
- Legionella sp.
- Trench foot or Immersion foot

Disaster Strategy 7:

Understand the specific challenges of evaluating and managing water-related disease associated with *exposure to chemical agents* in flooded or contaminated drinking water.

The *spectrum of medical sequelae* ranges from mild symptoms to severe tissue damage depending upon the toxicologic profile of the waterborne chemical agent.

Medical Challenges from Chemical Contamination of Katrina Flood Waters

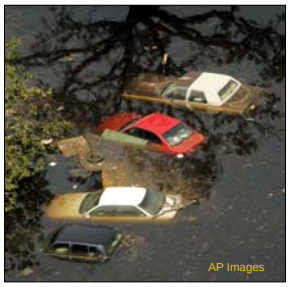
Estimates indicate contaminated waters in New Orleans contained:

- **6.7 million gallons of petroleum from damaged refineries**
- **Chemical contamination from more than 390 oil spills**

Medical Challenges from Chemical Contamination of Katrina Flood Waters

Cont.

- **1-2 million gallons of gasoline from damaged gas stations**
- **Chemical release from more than 300,000 flooded automobiles**



Medical Challenges from Chemical Contamination of Katrina Flood Waters

Cont.

- **31 hazardous waste sites in affected region**
- **446 industrial facilities in flood zone that used hazardous compounds including lead, mercury, hexavalent chromium, arsenic, benzene, and pesticides**

Disaster Strategy 8:

Recognize co-infections with waterborne pathogens coupled with multiple chemical agent exposure in contaminated water may result in BOTH *acute and delayed symptoms* complicating accurate and timely diagnosis.

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Disaster Strategy 9:

Understand that with respect to water contamination, disaster planning by public health and medical community is critical in both *populated and rural areas*.

Water systems in small rural communities are equally at risk as metropolitan municipal water systems and preparedness is vital, no matter how small or large the community.

Disaster Strategy 10:

Implement preparedness strategies and countermeasures that address BOTH *short- and long-term consequences* of water contamination events.

Water contamination events have the potential to produce delayed, prolonged, and environmentally mediated health effects for *weeks or even years* in a community.

Disaster Strategy 11:

Know that local medical and public health practitioners will be faced with providing *credible and timely risk communication* to their patients and the public after a disaster resulting in significant water contamination.

Disaster Strategy 12:

Prepare for *significant surge capacity* at medical facilities based upon the potential for large volumes of casualties exposed to contaminated water concurrently.

Disaster Strategy 13:

Develop collaborative partnerships with a MULTI-disciplinary TEAM approach to preparing for and responding to water contamination events locally and regionally including:

- **Healthcare providers**
- **Public health officials**
- **Water utility practitioners**
- **Emergency management**
- **Disaster response personnel**

Cont.

Disaster Strategy 13:

Cont.

- **National Guard**
- **Law enforcement professionals**
- **State and local government officials**
- **Community leaders**
- **Public risk communicators and media representatives**
- **Public and private sector industry and small businesses**

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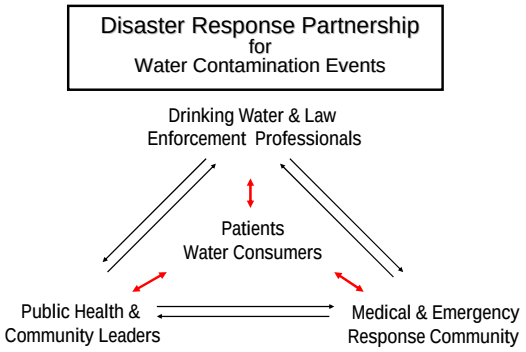

Disaster Strategy 14:

Include water disruption and water contamination in local and state exercise scenarios, comprehensive table top exercises, and emergency response plans.

Customize these disaster and terrorism preparedness scenarios to reflect field conditions at the local, state or regional level that address water hazards specific to area needs.

Disaster Strategy 15:

Arm your medical, public health, emergency response and disaster management community with information and *ready made disaster tools* addressing biological, chemical or radiologic contamination from natural, man-made or intentional contamination of water.

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Evaluation:
http://tinyurl.com/795ac

Website:
www.ualbanycphp.org

March 9, 2006

Making Sense of the NIMS
National Incident Management System
Special time: 10:00am – 11:30am

Donald F. Sutton PhD
Training and Education Coordinator
Colorado Department of Public Health and the Environment